Curriculum Mapping of the Spatial Science Program, QUT: What was the Cartography Journey?

Robert Webb

School of Urban Development

Faculty of Built Environment and Engineering

a university for the real world ®

Presented by Robert Webb

17 March 2009

Australian Map Circle/Mapping Sciences Institution Australia Conference 16-18 March, 2009 Brisbane Australia.


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← Brisbane
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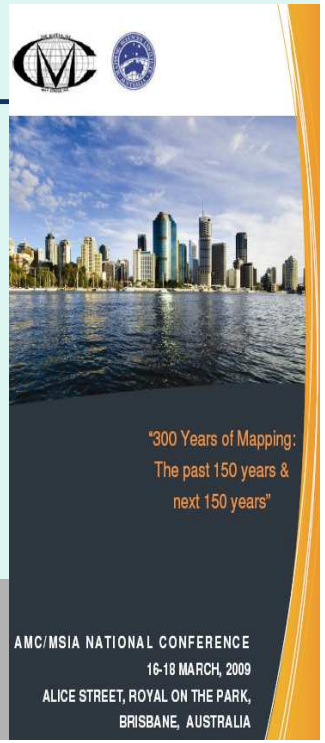
Introduction

- Explain what is Curriculum Mapping
- What approach adopted & applied to the Spatial Science program at QUT?
- Explain the major re-structure in 2006
- What does the current course look like now?
- Explain Thematic: whole of course quality terrain
- Brief history survey & mapping courses @ QIT/QUT
- What was the cartography journey?
- Explain WIL- improving “graduate employability”
- Conclusions



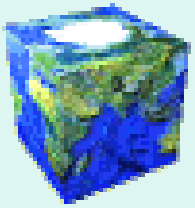
What is Curriculum Mapping?

- Central element of curriculum mapping is an exercise involving staff review of
  - learning outcomes, content, learning activities, and assessment of a given course
  - identify where and how graduate attributes are taught, practised, and assessed within the whole course.
- This exercise shows that many graduate attributes are already being developed but not in an explicit way.
- The Curriculum Mapping process can reveal opportunities for new or improved alignment between aspects of course design.

What is Curriculum Mapping?

- most common approaches to developing graduate attributes in Australia and internationally is curriculum integration or embedding.
- Involves facilitating students' development of graduate capabilities within disciplinary contexts of the courses they undertake as part of their undergraduate university programs.

- Informed by QUT Teaching Capabilities Framework
- a framework to guide and steer the effective development of practice and scholarship surrounding teaching and learning.

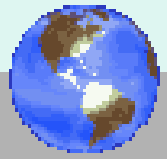


QUT Teaching Capabilities Framework

- Four dimensions to this framework

1. Engaging Learners
2. Designing for Learning
3. Assessing for Learning
4. Managing for Learning

Graduate attributes inform the wider community about the qualities, skills, knowledge and abilities developed by the University's graduates.



The Curriculum Mapping Process adopted for Review of Spatial Science @ QUT

- Influenced / informed by following:

1. University of Qld – Teaching & Learning Support

   -mapping and embedding graduate attributes approach

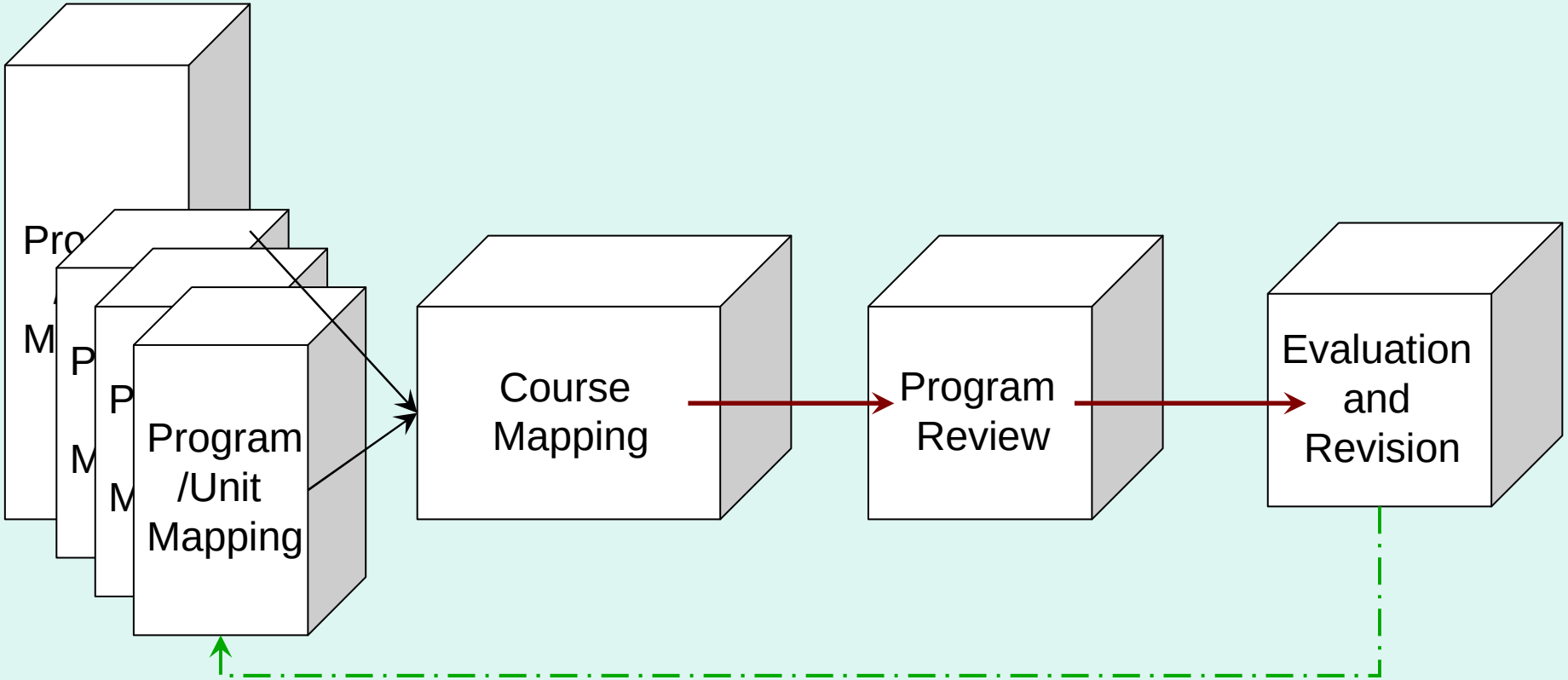
2. University of NSW- Learning and Teaching

   - curriculum mapping approach

3. Consideration of own QUT teaching and learning frameworks with supportive graduate capabilities resources.

C.M. Process @ Spatial Science QUT

Hybrid Model – 4 Sequential Segments



C.M. Process @ Spatial Science QUT
Hybrid Model – 4 Sequential Segments

- **1: Program mapping** - What do the learning outcomes and graduate capabilities mean when applied to graduates of the Spatial Science unit/program?

- **2 Course mapping** - How does each of the units within a program support the development of discipline specific graduate attributes? Several thematic layers applied to fundamental course map matrix to determine strengths/ weakness.

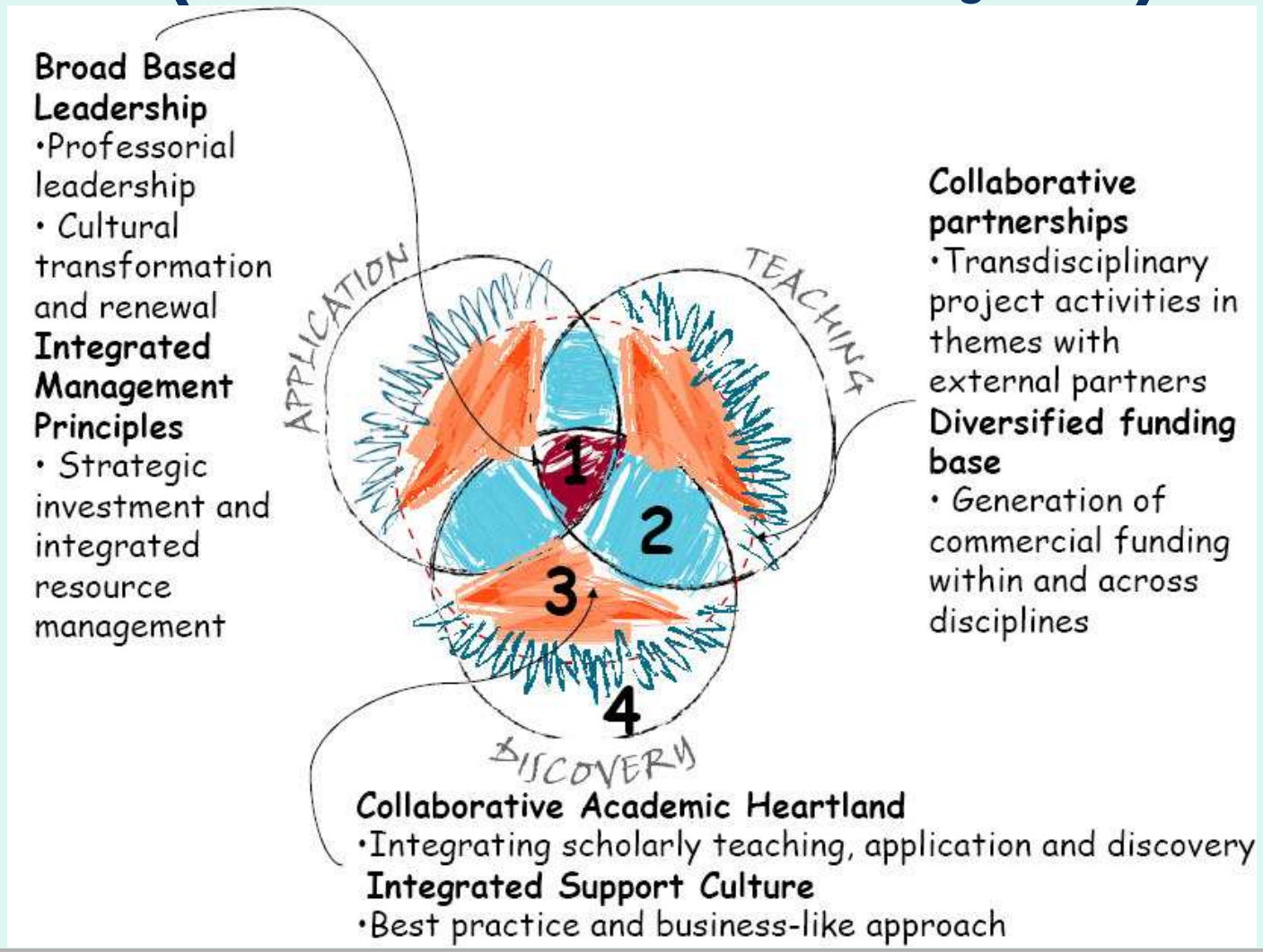
C.M. Process @ Spatial Science QUT
Hybrid Model – 4 Sequential Segments

- **3: Program review** - How does the whole program contribute towards the expected graduate capabilities? *Faculty/ University level.*

- **4: Evaluation and revision** - How can discipline themes and individual learning units be refined to ensure developmental and sequential support for students to develop program graduate attributes? *4-5 year cycle*

- *MORE DETAILS IN THE PAPER*

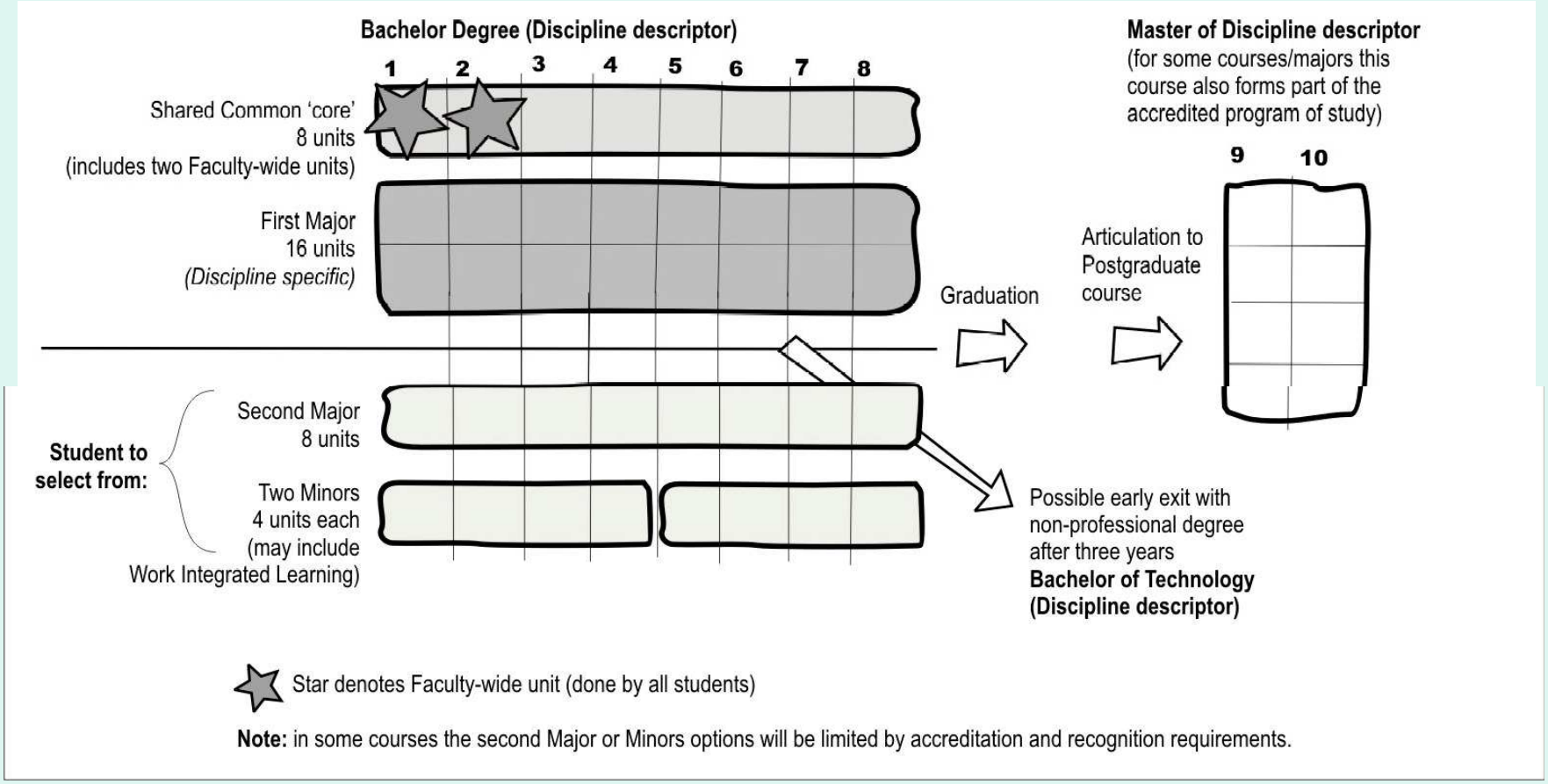
Faculty of BEE model of working (modified from Crowther and Savage 2008).



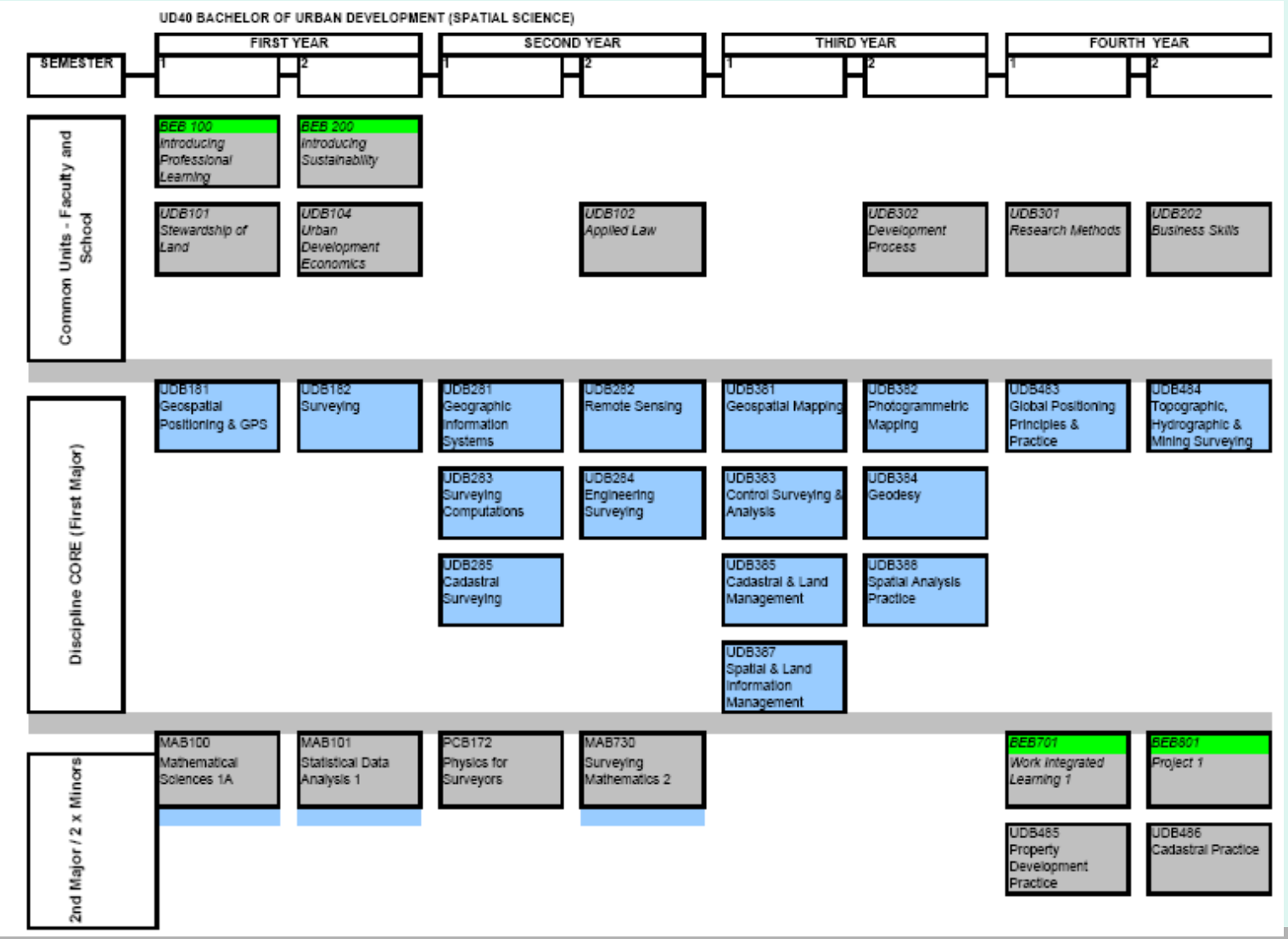
Some overarching principles of the Desired BEE Undergraduate Model

- Crother and Savage (2008) describe this coming together of these Faculty goals, and ideas of transformative learning. *More info in the paper*
- These courses would provide the student with:
  - Opportunities for self construction and divergence
  - Opportunities for integrated trans-disciplinary study
  - Opportunities to learning through and in practice (workplace learning)
  - Opportunities for articulation
  - Opportunities to engage in discovery (research) and application (external and community service) activities through a thematic approach to faculty activities. (Crother and Savage 2008)

Desired Model of the Shared Course Structure BEE



S.A.M.S. Basic Course Map



An Enhanced Thematic Representation

2008 Course Matrix: UD40 Bachelor of Urban Development (Spatial Science)

	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2
FACULTY WIDE UNITS	BEB100 Introducing Professional Learning[1]	BEB200 Introducing Sustainability[1]					BEB701 Work Integrated Learning[1, 4]	BEB801 Project[1, 4]
SCIENCE THEME (minor)	MAB100 Mathematical Sciences 1A[3]	MAB101 Statistical Data Analysis[3]	PCB172 Physics for Surveyors[3]	MAB730 Surveying Mathematics[3]			UDB301 Research Methods[2]	UDB202 Business Skills[2]
LAND DEVELOPMENT/ CADASTRAL THEME	UDB101 Stewardship of Land[2]	UDB104 Urban Development Economics[2]	UDB285 Cadastral Surveying[5]	UDB102 Applied Law[2]	UDB385 Cadastral & Land Management[5]	UDB302 Development Process[2]	UDB485 Property Development Practice[4]	UDB486 Cadastral Practice[4]
MEASUREMENT SCIENCE SURVEYING THEME		UDB182 Surveying[5]	UDB283 Surveying Computations[5]	UDB284 Engineering Surveying[5]	UDB383 Control Surveying & Analysis[5]	UDB384 Geodesy[5]	UDB483 Global Positioning Principles and Practice[5]	UDB484 Topographic, Hydrographic & Mining Surveying[5]
MAPPING SCIENCE THEME	UDB181 Geospatial Positioning and GPS[5]			UDB282 Remote Sensing[5]	UDB381 Geospatial Mapping[5]	UDB382 Photogram-metric Mapping[5]		
GIS THEME			UDB281 Geographic Information Systems[5]		UDB387 Spatial & Land Information Management[5]	UDB388 Spatial Analysis Practice[5]		

1 = Faculty-Wide unit; 2 = School based common unit; 3 = Science Minor unit; 4 = Applications Minor unit; 5 = Spatial Science Core unit

Course Map Matrix – Spatial Science

COURSE MAP 2009: UD40 Bachelor of Urban Development (Spatial Science)

SPATIAL SCIENCE UD40SS	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2
Spatial CORE UNITS (18 units)	UDB181 Geospatial Positioning and GPS[5]	UDB182 Surveying[6]	UDB283 Surveying Computations[6]	UDB284 Engineering Surveying[5]	UDB383 Control Surveying & Analysis[5]	UDB384 Geodesy[5]	UDB483 Global Positioning Principles and Practice[5]	UDB484 Topographic, Hydrographic & Mining Surveying[5]
SCIENCE Minor (4 units)	MAB100 Mathematical Sciences 1A[3]	MAB101 Statistical Data Analysis[3]	PCB172 Physics for Surveyors[3]	MAB730 Surveying Mathematics[3]	UDB387 Spatial & Land Information Management[5]	UDB388 Spatial Analysis Practice[6]	UDB485 Property Development Practice[4]	UDB486 Cadastral Practice[4]
School Focused Units (6 units)	UDB101 Stewardship of Land[2]	UDB104 Urban Development Economics[2]	UDB285 Cadastral Surveying[5]	UDB102 Applied Law[2]	UDB385 Cadastral & Land Management[5]	UDB302 Development Process[2]	UDB301 Research Methods[2]	UDB202 Business Skills[2]
Integrated Transdisciplinary Units (4 units)	BEB100 Introducing Professional Learning[1]	BEB200 Introducing Sustainability[1]	UDB281 Geographic Information Systems[5]	UDB282 Remote Sensing[6]	UDB381 Geospatial Mapping[5]	UDB382 Photogram-metric Mapping[6]	BEB701 Work Integrated Learning[1, 4]	BEB801 Project[1, 4]

1 = Faculty-Wide unit; 2 = School based common unit; 3 = Science Minor unit; 4 = Applications Minor unit; 5 = Spatial Science Core unit

UD40URBANCOURSEMAPDRAFTONLY2009.DOC *Compiled by Robert Webb* **WORKING DRAFT**

Bachelor of Urban Development (Spatial Science)

Shared Common Core

- *Introducing professional learning**
- *Introducing sustainability**
- *Stewardship of land*
- *Applied law*
- *Urban Development Economics*
- *Development process*
- *Research methods*
- *Business skills*



2008: LEX Unit05 Question

> I have been satisfied with the overall quality of this unit.

Scale 0.0 to 5.0

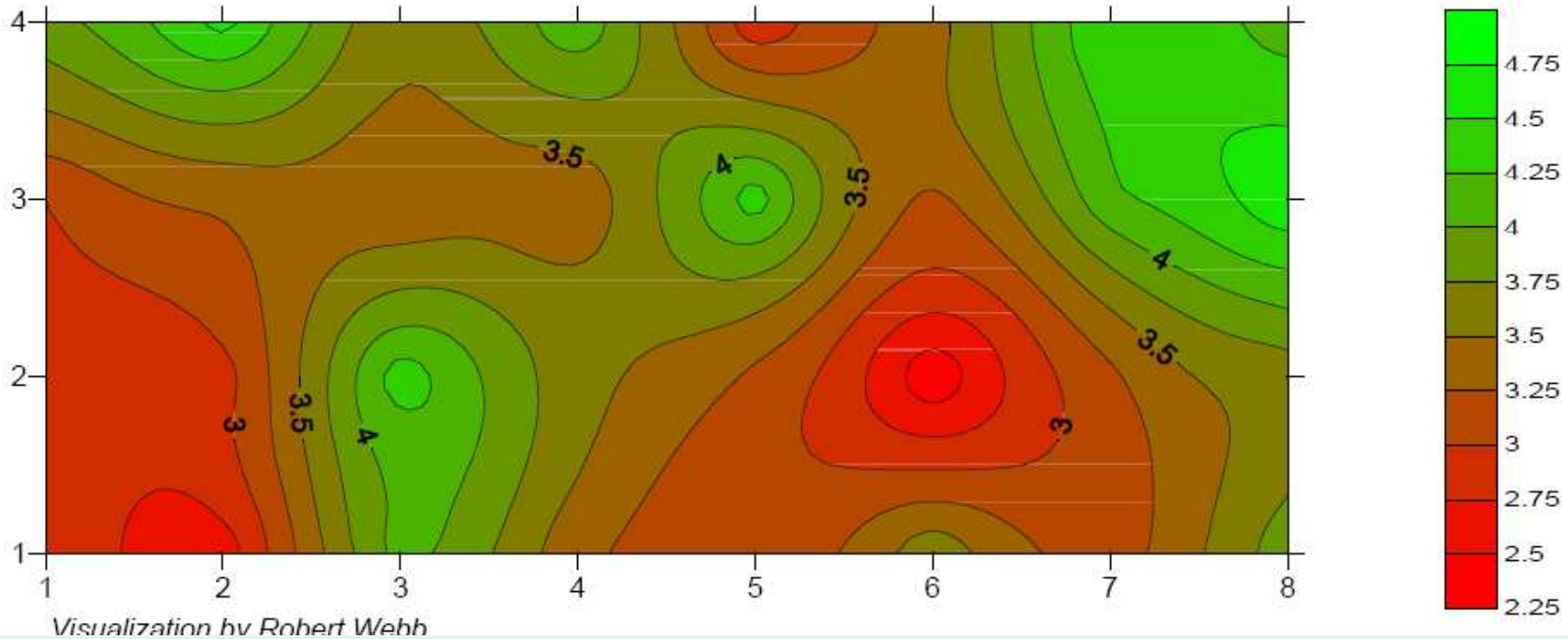
Unit Quality LEX U05 Matrix 2008: UD40 Bachelor of Urban Development (Spatial Science)

SPATIAL SCIENCE UD40SS	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2
Spatial CORE UNITS (18 units)	UDB181 Geospatial Positioning and GPS[6] **3.9**	UDB182 Surveying[6] **4.6**	UDB283 Surveying Computations[6] **3.5**	UDB284 Engineering Surveying[5] **4.2**	UDB383 Control Surveying & Analysis[5] **2.8**	UDB384 Geodesy[5] **3.4**	UDB483 Global Positioning Principles and Practice[6] **4.5**	UDB484 Topographic, Hydrographic & Mining Surveying[6] **4.1**
SCIENCE Minor (4 units)	MAB100 Mathematical Sciences 1A[3] **3.3?**	MAB101 Statistical Data Analysis[3] **3.3?**	PCB172 Physics for Surveyors[3] **3.3?**	MAB730 Surveying Mathematics[3] **3.3?**	UDB387 Spatial & Land Information Management[5] **4.1**	UDB388 Spatial Analysis Practice[6] **3.2**	UDB485 Property Development Practice[4] **4.2**	UDB486 Cadastral Practice[4] **4.7**
School Focused Units (6 units)	UDB101 Stewardship of Land[2] **3.0**	UDB104 Urban Development Economics[2] **2.9**	UDB285 Cadastral Surveying[5] **4.4**	UDB102 Applied Law[2] **3.6**	UDB385 Cadastral & Land Management[5] **3.2**	UDB302 Development Process[2] **2.3**	UDB301 Research Methods[2] **3.2**	UDB202 Business Skills[2] **3.6**
Integrated Transdisciplinary Units (4 units)	BEB100 Introducing Professional Learning[1] **2.9**	BEB200 Introducing Sustainability[1] **2.6**	UDB281 Geographic Information Systems[5] **4.1**	UDB282 Remote Sensing[6] **3.3**	UDB381 Geospatial Mapping[5] **3.0**	UDB382 Photogram-metric Mapping[6] **3.7**	BEB701 Work Integrated Learning[1, 4] **3.1**	BEB801 Project[1, 4] **3.9**

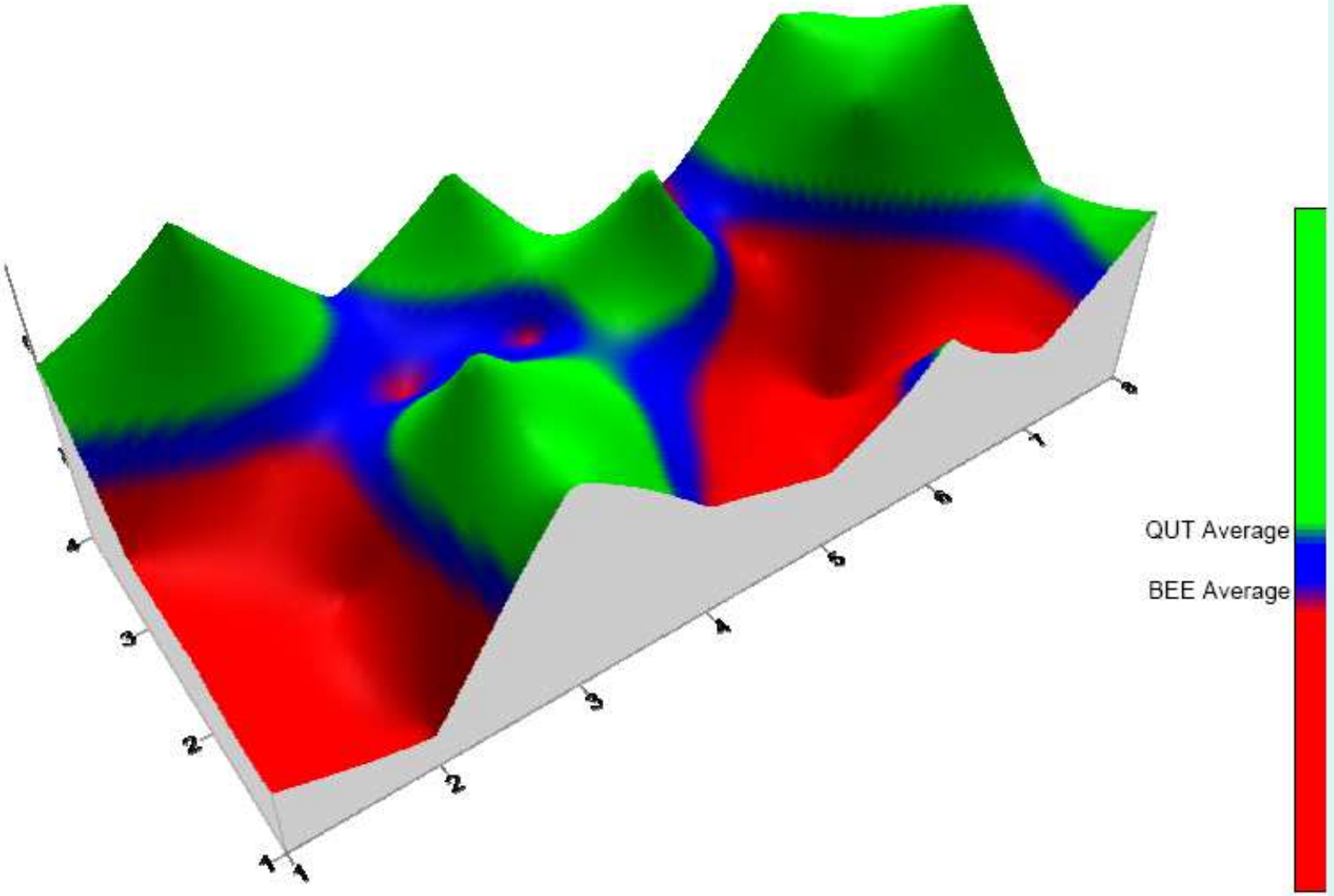
1 = Faculty-Wide unit; 2 = School based common unit; 3 = Science Minor unit; 4 = Applications Minor unit; 5 = Spatial Science Core unit

NOTE: 4th year units are based on equivalent old course units 2008.

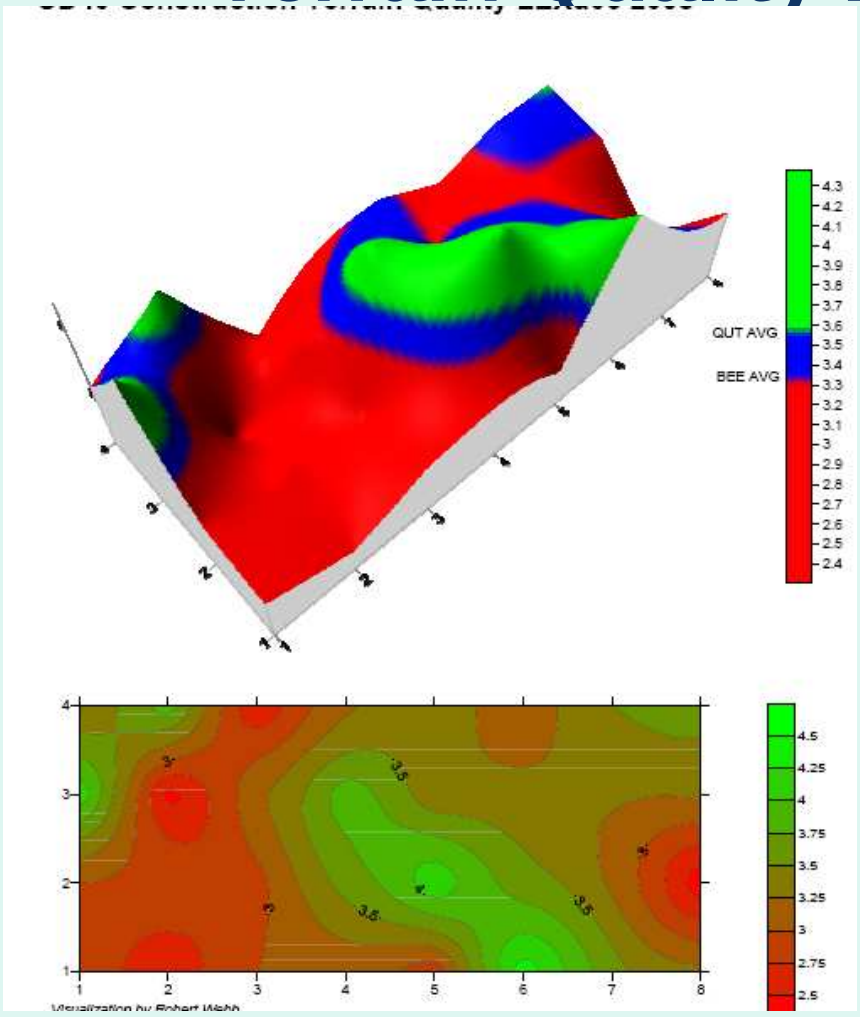
2008 Contours of LEXU05 Quality Question

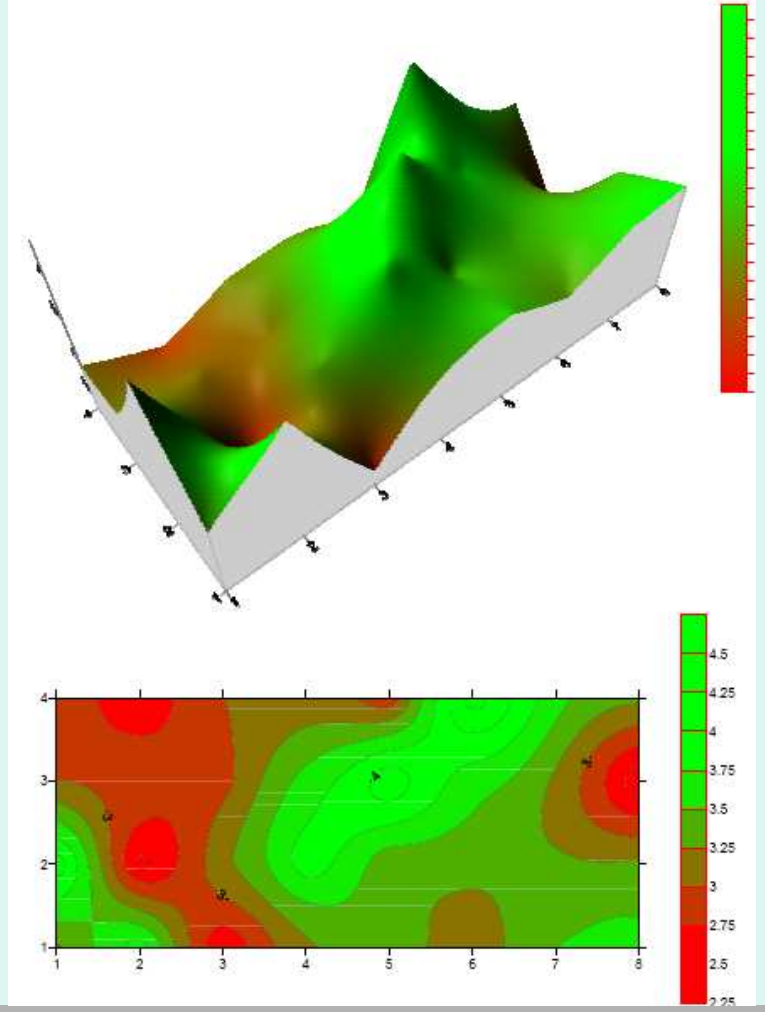


UD40 Spatial Terrain Quality 2008 LEXu05

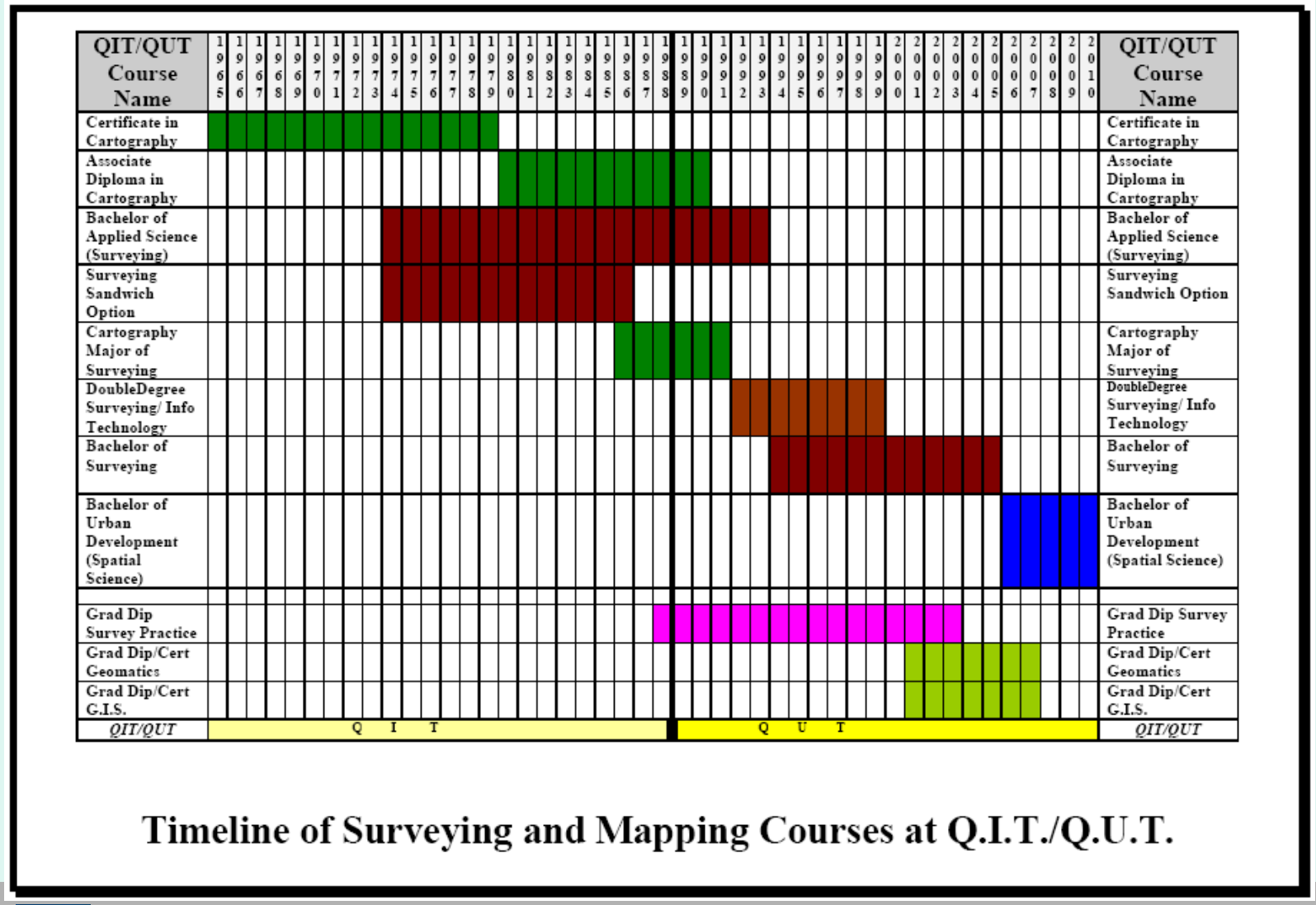


Other Urban Development Disciplines Terrain-Quality Presentation Trials





Some History of Survey & Mapping Programs



Timeline of Surveying and Mapping Courses at Q.I.T./Q.U.T.

What was the Cartography Journey?

- The Mapping and GIS focused theme of the new 32 unit program have contracted to an identified **six and half units (twenty percent).**
- The first year, first semester unit known as Geospatial Positioning and GPS conveniently abridges the Measurement Science and Mapping Science themes --intended as a introductory foundation unit.
- An obvious contraction of cartography/ mapping/ spatial information units has occurred from the 2006 incremental implementation, *as shown in the next slide.*

Mapping/ GIS Theme units highlighted from the older Bachelor of Surveying Course.

Course Structure (January 2005) : PS47 Bachelor of Surveying

Year 1		Year 2		Year 3		Year 4	
Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2	Semester 1	Semester 2
		PSB610 Govt & Law	PSB611 Intro Urb & Reg Econ	**PSB612 Spat/Land Info Mgmt**	PSB613 L. Dev Prin Pol	PSB614 Urb Rur Dsgn Prin	PSB615 Urb Rur Dsgn Prac
PSB414 Prof. Skills 1		**PSB620 Cadas Surv & Map**		CEB259 Eng Dsgn L Dev			PSB621 Adv Cadastral Surv
PSB412 Computer Skills	PSB422 Environ Science					PSB650 Project/Elective	
				ELECTIVE PSB655 (Remote Sensing)	PSB463 Elective (PSB652) (Topics in Land A)	**ELECTIVE PSB654 (Topics in Spatial Infoirmation)**	PSB651 Project/Elective (PSB653) (Topics in Surv Eng)
PSB424 Land Science	PSB640 Surveying						
		PSB630 Carto & Dig Mapping	**PSB631 Geographic Info Sys**		**PSB632 Photogrammetry**	**PSB633 Map Prod Princ Prac**	
	PCB172 Physics for Surveyors						
	DBB646 Surveying Computations		PSB641 Eng. Surveying	PSB642 Cont Surv & Analysis	PSB643 Geodesy	PSB644 Adv Geodesy	PSB645 Surv & Map Proc

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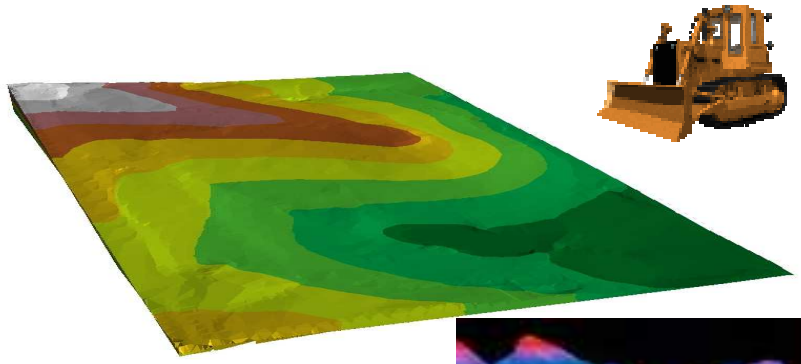
New Mapping Science/ GIS Themes

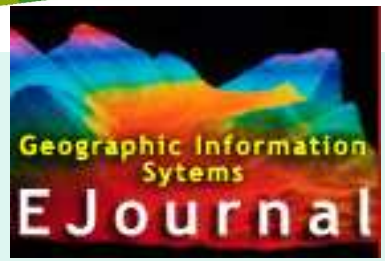
Photogrammetric Mapping: Strength over time?

- However, a continuing strength between these two surveying and mapping courses (comparing 2005 with 2008) has been the teaching alignment of photogrammetric mapping principles, practice and applications.
- The preliminary curriculum mapping process has shown a consistency in delivery and outcomes through this photogrammetric unit.

Spatial Science Minor

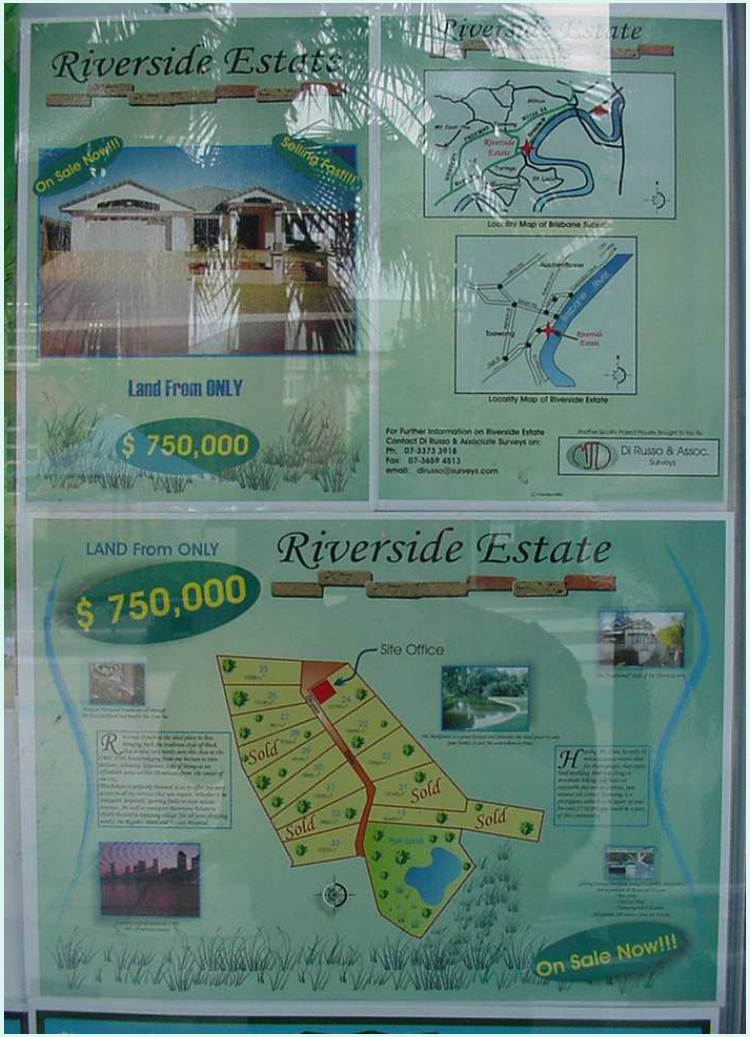
offered to other programs
Student choice of 4 units



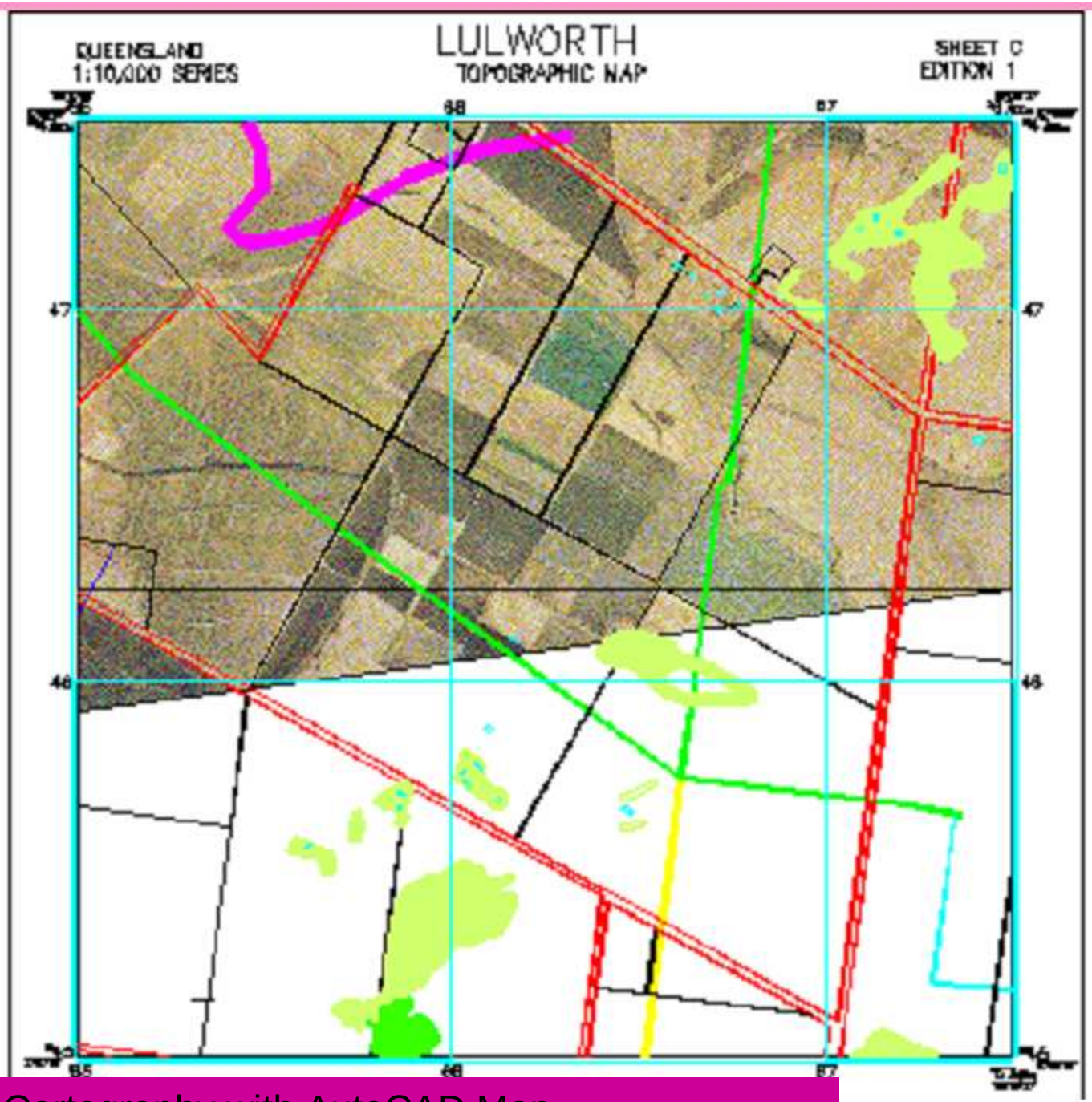


- ***Geospatial Positioning and GPS***
- ***Geographic Information Systems***
- ***Remote Sensing***
- ***Geospatial Mapping***
- ***Spatial and Land Information Management***
- ***Spatial Analysis Practice***

What do the Mapping Science students produce?



Student Outputs: 1:10,000 Custom Mapping- Topographic Line and Image Mapping



Rule- Based Cartography with AutoCAD Map

Photographer: Jessica Smith 2008

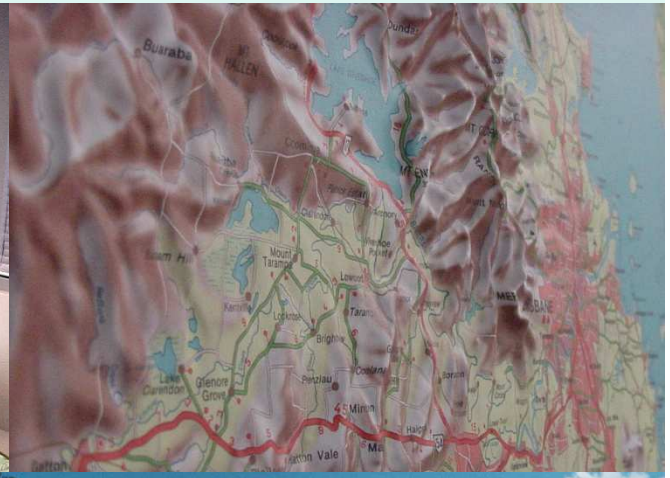
Other Themes of the **Spatial Science @ QUT** include

1. **Measurement Centric Theme** sequential learning units with rigid pre-requisites

2. **Land Development Theme** with strong cadastral surveying “flavor”. Recognition received from Surveyors Board of Qld when mapped against the Qld Surveyors Board Competency Frameworks (2007)

Photographer: Robert Webb 2007

Work Integrated Learning (WIL) Environments



Work Integrated Learning (WIL)

- WIL can be described as a form of practical education that integrates periods of academic study with periods of work experience in jobs related to the students study area.
- Increasing pressure on Australian Universities to give greater emphasis and accept more responsibility for "**graduate employability**".
- Two instruments used nationally measure and report graduates success in gaining employment.
  - Graduate Destination Survey (GDS) and Course Experience Questionnaire (CEQ)

Partnerships:

- Distinctive feature of effective work-placement programmes (such as occurs in nursing programs) is that they involve partnerships among diverse groups:--
- Employers
- Students
- Academic teachers
- Higher education managers
- And professional bodies

Summary of W.I.L. Teaching

- The teaching and learning content in the WIL unit(s) predominantly will be delivered in the workplace, under the supervision of practicing professional.
- The duration of the WIL directed employment will vary as required by the specified Course/Major (study area).
  - For Spatial Science, this is a minimum of 14 days over a 15 week period.
  - These WIL days ALSO contribute towards the 90 days industrial experience requirement.

Where have we been located at Gardens Point?

School of Surveying 1976-1987

School of Planning, Landscape Architecture and Surveying (PLAS) 1988-1999

School of PLAS/DBE 1999-2005

School of Urban Development

2006-2009

QUT


M1
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Image © 2009 DigitalGlobe
61 m
Pointer 56 J 502811.71 m E 6960777.71 m S elev 18 m Streaming 100%
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Eye alt 120 m

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Conclusions (a)

Curriculum Mapping of the Spatial Science Program, QUT

- ✓ Ongoing development in both the theory and principle and practice aspects of Mapping Science, Cartography and Geographic/Spatial Information Systems will continue to present opportunities and challenges for universities.

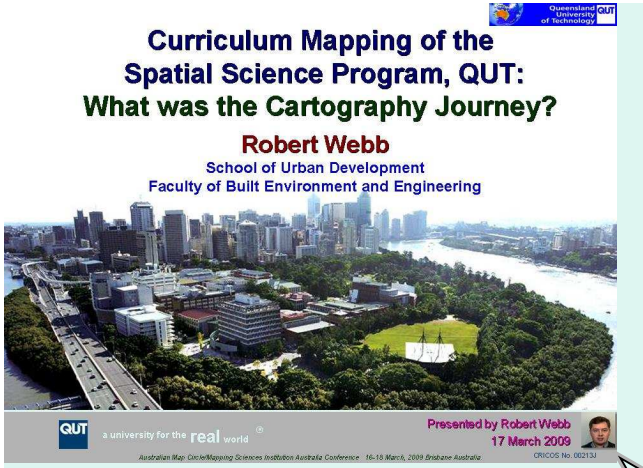
- ✓ The challenge of curriculum design at university level is to adapt programmes within structural constraints to respond to the incremental theoretical and practical developments to enhance the education of tomorrow's Mapping Science and GIS professionals

Conclusions (b)

Curriculum Mapping of the Spatial Science Program, QUT

- ✓ The role of curriculum mapping in whole of course design has been shown to be a useful process to academic and unit content advisors as it often looks at
  - ✓ recent past reflections
  - ✓ is informed by communities of best practice
  - ✓ attempts to manage rapidly changing technology relating to technical and professional issues.

- ✓ Academic staffs contributing to the undergraduate programs agree that applying curriculum mapping, supported by industry stakeholders, will provide outstanding learning environments and lead to excellent outcomes for future spatial science graduates.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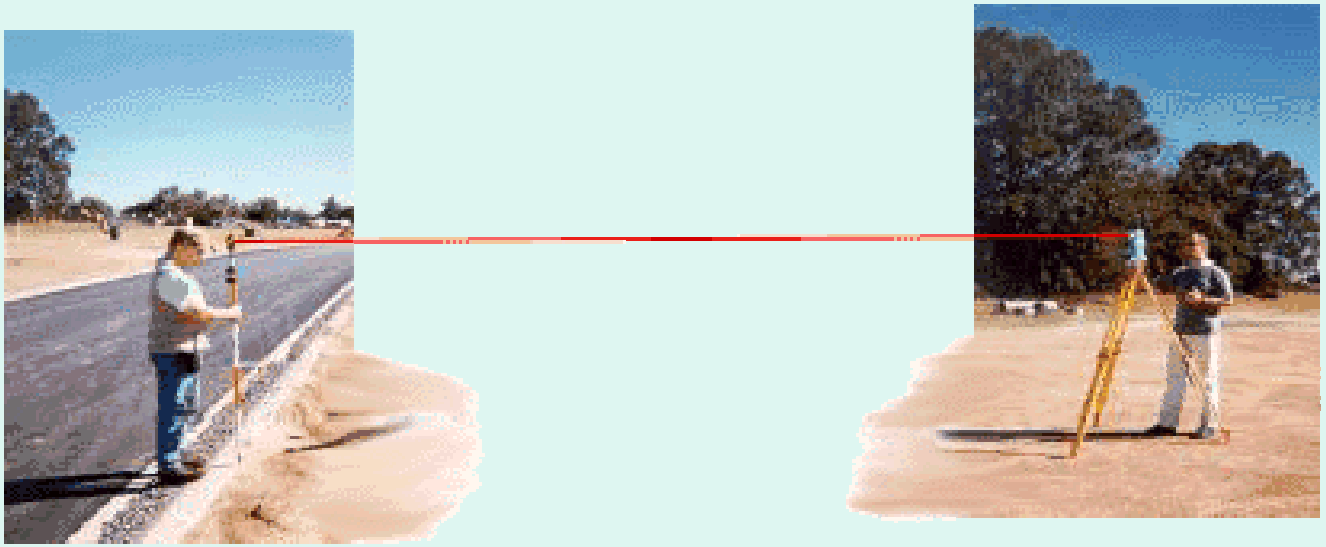
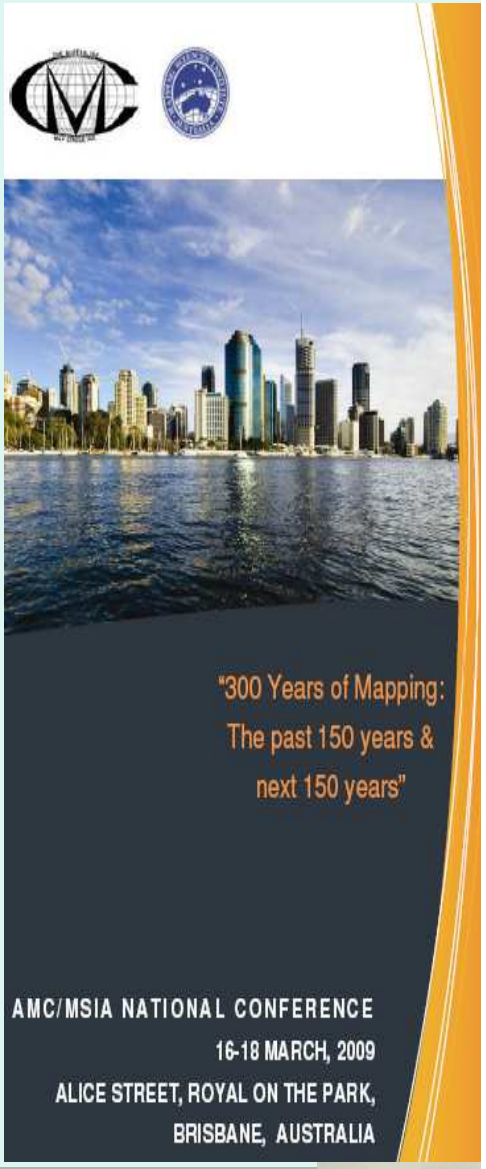
Questions?




"300 Years of Mapping:
The past 150 years &
next 150 years"
AMC/MSIA NATIONAL CONFERENCE
16-18 MARCH, 2009
ALICE STREET, ROYAL ON THE PARK,
BRISBANE, AUSTRALIA

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